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ABSTRACT

Investigated were the effects of an elementary methods course on preservice teachers. The preservice teacher's perception and performance of role expectations in the teaching of science, the preservice teacher's attitude toward science in the elementary classroom, and the preservice teacher's knowledge and performance in inquiry skills were the three areas explored. Students enrolled in two different pre-professional programs were involved in the study. The control group was from a more traditional program, emphasizing methods courses and student teaching. The experimental group involved a campus-based field experiences sequence as well as methods courses and student teaching. Several instruments were used for measurement in the areas of inquiry (process) skills, attitudes, and teaching behaviors. Administration of instruments occurred before and after the science methods course and at the end of student teaching. It was noted that although mixed results were apparent, the major difference in methods course experiences occurred in the ability of students with field experience to more adequately model specific teaching roles when asked to do so. Other results and implications are discussed. (CS)

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FINAL REPORT

A COMPARISON OF TWO PRE-PROFESSIONAL PROGRAMS IN THE DEPARTMENT OF EARLY CHILDHOOD ELEMENTARY EDUCATION

by

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INTRODUCTION

The Department of Early Childhood-Elementary Education has recently completed a major revision of its professional undergraduate program in elementary education. For a variety of reasons, change toward more involvement in elementary classroom settings was initiated in the professional semester. The old or traditional program was for a short period offered at the same time as the professional semester. This offered an opportunity for comparison of the effectiveness of the programs.

The areas to be investigated were centered around problems associated with the preparation of elementary school teachers which have been expressed by many teacher educators. The degree and variables affecting the competence a preservice teacher can be expected to achieve in teaching science as a result of science methods courses and experiences gained during the period of undergraduate education was the subject of this study.

While there may be disagreement about the order and value of the problems, teacher educators see at least three major problem areas. One is that prospective teachers have a poorly developed sense of what teaching is about. Identification tends toward most recent contacts with teachers, university professors, and with past remembrances of the elementary classroom experience. Piltz (1974), in a study of classroom teachers found lack of confidence, training in methodology, and interest were important factors which handicap the teaching of science in the elementary school.

A second problem involves feelings and attitudes of the prospective and inservice elementary teacher toward science, children being involved in science learning activities and the teaching of science (Schimirlan 1968). If attitudes are learned and are not innate nor the result of maturation, they can be taught (Shaw and Wright, 1967). Shrigley (1972), found that experience in an elementary school with an organized (time set aside regularly each week)

science program affects the science attitude of pre-service teachers positively.

The third problem involved intellectual development. Piaget states that formal operations begin to emerge at around eleven years of age. Research studies have shown that 82% of thirteen and fourteen year olds (Friot, 1970) and 75% of entering college freshmen (McKinnon and Renner, 1971) were approaching problems almost wholly on the concrete operational level. McKinnon and Renner stated in their conclusion that it appeared that teachers were having neither the learning experiences in college which they must have in order to allow thought processes to develop nor those which would permit them to learn the value of inquiry in educating a child. The failure of teachers to use and value intellectual inquiry processes might well be reflected in student performance in the classrooms forming an unbroken cycle of underdeveloped intellectual potential.

The research questions investigated by this study includes the three problems above and their interrelationships with teaching science in the elementary school. A. Does the type of experience in an elementary methods courses affect a preservice teacher's perception and performance of role expectations in the teaching of science? B. Does the type of experience in an elementary methods course affect a preservice teacher's attitude toward science in the elementary classroom? C. Does the type of experience in an elementary methods course affect preservice teacher's knowledge and performance in inquiry skills?

PROCEDURE

The investigation involved the longitudinal analysis of preservice teachers in the Early Childhood-Elementary Education Department. Data was gathered on the preservice teachers throughout the period involving a science methods course and student teaching.

The behaviors investigated by the instruments were consistent with teaching roles involved in the instructional methodology of the "new" elementary science curricula. The new curricula from which behaviors were drawn are made up of the science curriculum improvement projects developed over the last twelve years, of which Science - A Process Approach and Science Curriculum Improvement Study are important examples

Sample and Treatment Groups

The population, 169 students from six classes, from which the sample subjects were drawn, included two different pre-professional programs. The first treatment, involving the traditional campus methods course sequence offered in the Department during and before Spring, 1974, was designated as the control group. This involved students completing 10 credit hours of methods courses and 16 credit hours of student teaching. The methods courses, five two credit courses, met two hours per week in a campus classroom and were taken by the student over a two or three semester period. The course topics were language arts, math, reading, science and social studies.

The second treatment, the campus based-field experiences sequence offered in the Department during and after Spring 1974, was designated as the experimental group. This involved students completing 15 credit hours of methods courses and 11 hours of student teaching. The five methods courses; three credit hours each, included two contact hours in the campus classroom and two contact hours in an elementary school weekly. All five methods courses were to be taken during one semester, the professional semester. This added to a total of two days spent on campus and two days spent in an elementary

classroom per week. The sample investigated included twenty-one students from three traditional science methods courses - EDEL 302, the control group, and twenty-one students from three campus based field experience courses - EDEL 353, the experimental group. Both of these courses similarly stressed instructional methodology, appropriate role behaviors in teaching elementary science, in addition to inquiry skills, application of learning theory and the nature of elementary science curricula. The only important differences between the courses were in assignments, especially those to be done in the field, and time for field experiences, four one hour sessions as against 20-25 possible hours experiencing science teaching in a classroom.

Instruments

The instruments used during the course of the study involved measurements in the areas of inquiry (process) skills, attitudes and teaching behaviors. They involved the following instruments:

A. Inquiry Skills Area

1. Science Process Measure (SPM) - An 18 task item performance test designed to measure knowledge and ability in nine process skill areas - observing, classifying, using spatial relationships, measuring, communicating, predicting, interpreting data, controlling variables and hypothesizing. Each task contained between two and six subparts. This test was given at the beginning and end of the methods courses. Test-retest reliability for the pretest was 0.72 and posttest, 0.84.

B. Attitude Area

1. Teaching Preference Scale (TPS) - A preference ranking of teaching language arts, math and social studies toward science in an elementary classroom. A two point scale was used with each of the six items on the TPS.

2. Semantic Differential Instrument for Science Teaching (SDIS) -

A semantic differential considered attitudes toward nature, children learning science in classrooms and teaching science to children. A 0-4 scale was used with each of the 54 items on the SDIS. These tests, TPS and SDIS, were administered three times; at the beginning and end of the methods courses, and at the end of student teaching.

3. Course Rank - A simple ranking of University courses, taken along with the science methods course, from most interesting to least interesting. This was administered at the beginning and end of the science methods course. Change in ranking between these times was then calculated.

4. Course Value - A 0-4 scale indicating value of science methods course to experiences encountered in student teaching. This was given along with the other attitude measures, TPS and SDIS, at the end of student teaching.

C. Teaching Behaviors

1. Microteaching Skills in Science (MSS) Checklist - An observational checklist of lesson planning and teaching behavior, consistent with the role behaviors to be exhibited while teaching the new science curricula. Five planning and three teaching categories make up the checklist. The planning areas are: a) use of intellectual development stages; b) use of performance objectives; c) lesson development; d) instructional sequencing; and, e) student evaluation. The teaching areas are: a) question asking skills; b) teacher behaviors; and c) student behaviors. A 0-4

point scale was used for each of the 67 items on the checklist. This checklist was administered to the subjects' lessons at the end of the methods course. Average rating reliability for the MSS checklist was 0.85 internal reliability was 0.88.

2. Survey of Classroom Activities for Science (SOCAS) - a Questionnaire designed to elicit responses of perceived teacher and student behaviors in the classroom as related to science instruction as exhibited in the new science curricula. The questionnaire items were validated as being related or not related to the teacher's role as advocated by the new science curricula. SOCAS items concerned a perservice teacher's perceptions of teacher and student behaviors which occurred during their classroom science lessons. A 0-4 scale was used with each of the sixty-one items. The questionnaire was administered after a science unit had been taught during student teaching. Instrument validity for this study was determined through use of a panel of judges and correlation of MSS ratings of sampled student teacher science lessons taught during the unit. The Pearson correlation obtained was 0.71.

RESULTS

The mean scores and standard deviations as measured by the study instruments for each group are listed in Table I. With each instrument the higher score indicates greater ability or emphasis of behaviors which are consistent with an instructional model as portrayed in the new science curriculum improvement projects. The times of instrument administration were:

T_1 = at the beginning of the science methods course

T_2 = at the end of the science method course

T_3 = at the end of student teaching

In addition the maximum score possible for each instrument is indicated.

A t-test was performed on the change in scores for each treatment group as compared to time T_1 . Significant changes within both the control and experimental groups occurred in inquiry skills and attitude between the testing times. Both groups significantly increased their knowledge and ability to perform inquiry skills. Also, the level of attitude scores on the SDIS was significantly increased by the course experience for the experimental group. Significantly high levels of SDIS scores is noted for both groups at the end of student teaching.

TABLE I

Summary of scores for instruments administered at different times in the areas of Inquiry Skills, Attitude and Teaching Behaviors

Area and Time of Administration	Control Group		Experimental Group		Maximum Score Possible
	Mean	SD	Mean	SD	
<u>Inquiry Skills</u>					
T ₁ - SPM	7.7	4.0	6.7	2.5	18
T ₂ - SPM	11.2*	2.3	11.0*	2.7	18
<u>Attitude</u>					
T ₁ - TPS	1.65	0.88	1.30	0.80	2
- SDIS	1.39	27.	126.	15.	216
T ₂ - TPS	1.70	1.08	1.65	0.75	2
- SDIS	138.	14.	129. *	22.	216
- Course Rank Change	0.0	1.50	1.38	1.06	6
T ₃ - TPS	1.67	0.91	1.59	1.50	2
- SDIS	146. *	20.	135. *	18.	216
- Course Value	2.30	1.30	2.95	0.89	4
<u>Teaching Behavior</u>					
T ₁ - MSS	140	27.	174.	34.	268
T ₂ - SOCAS	141.	35.	142.	31.	244

*As compared to Time T₁ a t-test indicates a significant difference at the P < 0.05 level.

Comparison of scores between groups using a two tailed t-test for homogeneous groups, is shown in Table II. As indicated, no significant differences were found between the control and experimental groups in inquiry skills and attitude, during the first week of the methods course.

At the end of the methods course significant differences were measured between groups in teaching behavior and in change of interest in the course. The experimental group performed significantly higher in teaching behaviors consistent with the roles necessary in the new elementary curricula. This experience involved planning and teaching a three lesson mini-unit in an elementary classroom. The experimental group as indicated by "course rank change" also changed their interest significantly, in a positive direction more than the control group.

No significant differences between the groups were measured at the end of student teaching in attitudes or perceptions. Differences between the groups in attitude remained extremely consistent during the three different administrations of the instruments.

TABLE II

T-Test Results Between Groups in Inquiry Skills, Attitude and Teaching Behavior

Area	t Value		
	First Week of the Science Methods Course	Last 2 weeks of the Science Methods Course	End of Student Teaching
<u>Inquiry Skills</u>			
SPM	0.97	0.17	
<u>Attitude</u>			
TPS	1.32	0.17	0.20
SDIS	1.81	1.42	1.76
Course Rank Change		2.33*	
<u>Teaching Behavior</u>			
MSS		2.35*	
SOCAS			0.07
Course Value			1.85

*P < .05

CONCLUSIONS AND IMPLICATIONS

As defined in this study, hypotheses concerning relationships between experience in methods courses, traditional and campus based field experiences, were posited. The relationships involved effects in the areas of inquiry skill performance, attitude, teaching perceptions, and teaching behaviors. Drawing upon the results of the study, the following conclusions can be made:

1. The type of experience in elementary methods courses, traditional and campus-based field experiences, does affect a perservice teacher's performance of role expectations in the teaching of science at at the end of the professional semester. However, no difference was noted in the perceptions of student teachers one semester later in role expectations in teaching science.
2. The type of experience in elementary methods courses, traditional and campus-based field experiences, does not affect a preservice teacher's attitude toward science in an elementary classroom.
3. The type of experience in elementary methods courses does not affect preservice teacher's knowledge and performance of inquiry skills. Both treatments were equally effective in producing significant change.

The conclusions indicate that measurement of differences between methods course experiences is not as easy as it first appears. Mixed results are apparent. Increased elementary classroom contact does not practically affect a preservice teacher's attitudes or perceptions. The major difference occurred in the ability to more adequately model specific teaching roles when called upon to do so. This alone is an important result.

Past studies (e.g. Butts and Raun, 1969; Newport and McNeill, 1970; and Ashley, 1967) have discussed the inability of inservice teachers to exhibit

role behaviors consistent with the new elementary curricula. Retraining programs were then structured and studied to overcome the problem. It appears, as the result of this study, that the ability to perform these role behaviors, can be strongly affected in an undergraduate campus-based field program. As measured at the end of the methods course sequence, teacher performance in a model teaching role is significantly affected by the addition of a scheduled field experience to traditional campus classroom activities.

Looking specifically at the campus classroom, no practical differences appear to have been affected in other areas of related concern. The same time available and similar course activities consistently resulted in significant gains in inquiry skill performance. The amount of gain produced was not affected by treatment difference. Also, the level of student attitude and perception was not affected by treatment difference. Statistically significant gains, however, were noted with the SDIS attitude instrument for the experimental group at the end of the methods course and for both groups at the end of student teaching. These gains do not appear to be practically significant. A level of attitude change of 3% or less of the total score possible is not great in terms of the amount of effort expended in the programs.

Implications lead in two directions regarding campus classroom experiences. Expected changes may not be possible given the present time and resources available in the campus classroom. If expected changes can occur, alternative course activities and resources need to be evaluated to determine their potential for producing attitude and perception changes. Retention of activities with the potential for significantly affecting teaching and inquiry skill performance must, however, be maintained.

Both treatment groups had similar attitudes and perceptions toward the teaching of science with similar classroom experiences and different off-

campus contacts. It can be concluded, therefore, that the longer time in elementary classrooms had little or no effect on preservice attitudes and perceptions toward teaching science. There is a need, then, to look at the type of elementary classroom experiences and opportunities available to preservice students during the professional semester and student teaching. In fact, the results of the study appear to indicate that certain inhibitors or non positive factors are present.

Out of a total of 150 to 175 hours during the professional semester and 350 to 400 hours during student teaching in the elementary classroom, a substantial number, 25-75 hours, could potentially have been involved with science. During this time positive attitudes and perceptions of the role of the teacher could have been demonstrated. If the elementary classroom experience, however, is detrimental or reinforces previous preservice teachers' attitudes and perceptions change would not appear. Effective campus classroom experiences may have had little follow-up in either of the treatments. Other evidence indicating this inhibiting effect during student teaching are the course rank and course value results. At the end of the methods treatment preservice teachers indicated significantly higher ranking of the science methods course. No difference, however, was seen in course value at the end of student teaching.

Implications for the field experience lead to a study of elementary classroom variables involving science teaching or the integration of science with other subject areas in classrooms used for preservice education. The variables to be studied include teacher attitude, weekly teaching time devoted to a "subject area," priority in teaching different "subject areas" and type of teaching roles displayed in classroom.

Other implications can be derived from this study. It is hoped that this paper leads to further discussion of the specific results and serves as an alternative model for program evaluation in the future.

Similar results in attitude and perception may be found in other subject areas involved in the professional semester. If corroborated, the program cannot assume that any teacher or classroom is effective in teacher education. Involvement of elementary classrooms might only include those which exhibit experiences and attitudes related to the goals of the professional semester faculty team. Similar considerations also need follow through in classrooms where student teaching is experienced.

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